

NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Progress in the Development of a Prototype Reuse Enablement System

General Background

In 2004 and 2005, the NASA Earth Science Data Systems (ESDS) Software Reuse Working Group (WG) conducted surveys of the community of Earth science software developers to learn about their reuse experiences and practices. The results showed that the lack of a centralized, domain-specific software repository or catalog system addressing the needs of the Earth science community is a major barrier to software reuse within the community. This led the WG to make the following [recommendations to NASA Headquarters](#):

WG Recommendations

- NASA should establish an effective mechanism for dissemination of reusable assets within the Earth science community.
- Based on the conclusions of a technology evaluation, NASA should implement a reuse enablement system.

In response, the WG was tasked to investigate the potential for existing systems to meet the software reuse needs of the Earth science community. The WG has undertaken a series of efforts designed to determine an expeditious and cost-effective solution to providing the proposed Reuse Enablement System (RES). This poster describes progress so far in developing a prototype of the proposed RES and the work associated with this, summarizing past work and presenting new work performed this year.

Trade Study

The initial trade study conducted in 2005 evaluated a variety of sites on their ability to function as a software reuse enablement system for Earth science software developers. It concluded that **none of the existing operational sites fulfilled the role of a software repository for the Earth science community**. This table shows part of the trade study results.

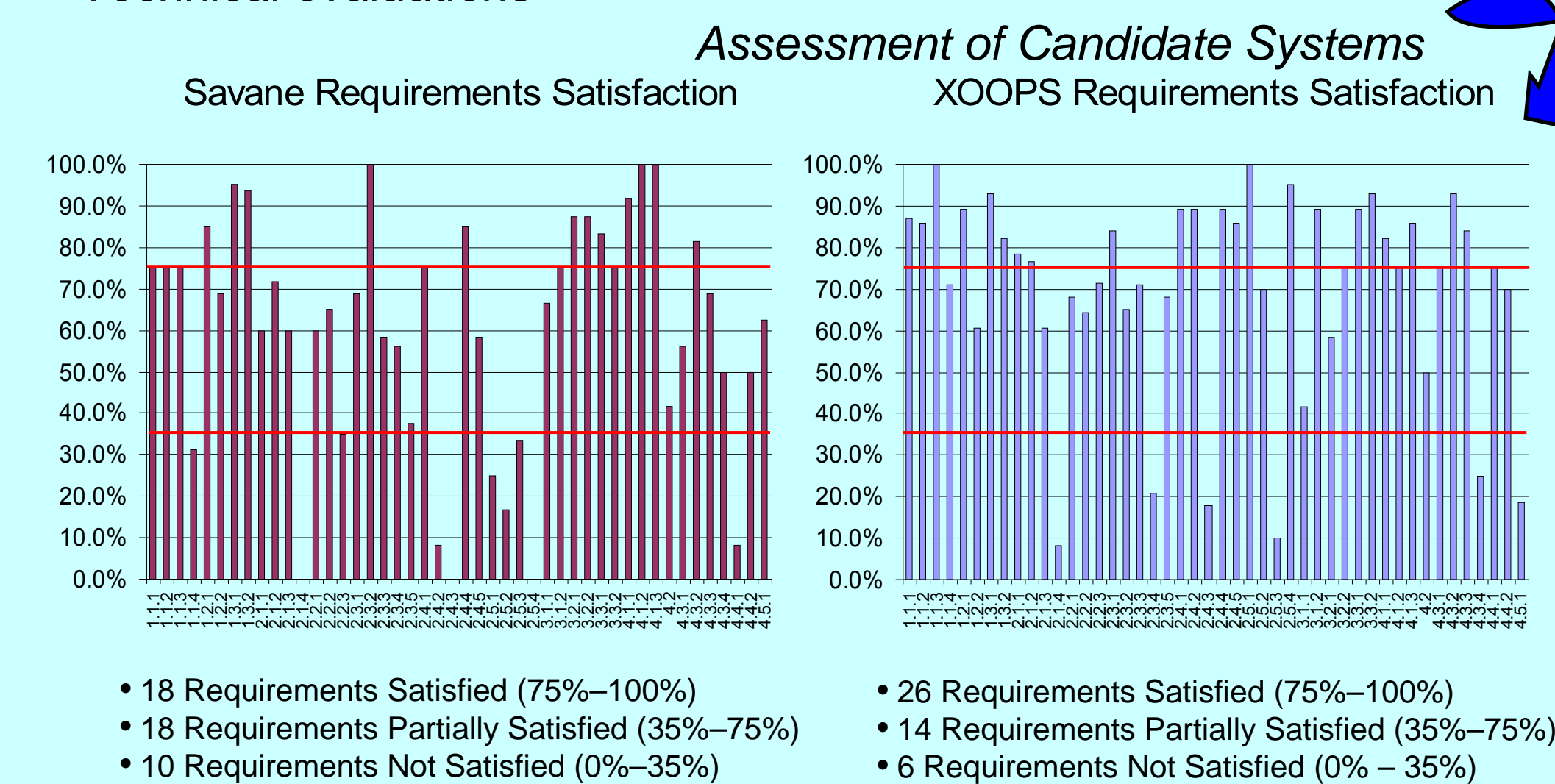
Requirement / Feature Domain	Global Change Master Directory (GCMD)	GSC Open Source Site	Open Source Site	Aster Open Source Site	HDF-EOS Tools Center	Compositional Technologies Project	Solaris Observing Clearhouse (SOC)	Planetary Data Systems
Type of Assets	Data sets, data services	Earth and space science	Open source packages	Open source packages	Applications	Earth and space science	Metadata	Toolkits and software
Register User		★					★★★	★★★
Contribute/Update Assets	★★★	★					★★★	★★★
System Feedback	★★★	★★★	★★★	★★★		★★★	★★★	★★★
Automatic Notifications	★★★							
Discovering Assets	Hierarchy, Search	List	List	List, Filter	Hierarchy	Search	List	
Register Asset Usage		★★★	★★★				★★★	★★★
Provide Asset Review	★★★	★						
Monitoring Feedback	★★★	★★★	★★★	★★★		★★★	★★★	★★★
Secure Log In / Registration	N/A	NO	NO	NO	N/A	YES	N/A	
Catalog or Repository	Catalog	Both	Both	Repository	Catalog	Catalog	Both	
Operation Support Technology	Large RSync, Zooz, CVS Linux, Java	Small PHP	Small JavaServer Pages	Both Inactive	Small Cold Fusion	Small HTML	Available	Both

Architecture Study

An architecture study was then conducted in 2007–2008 to determine the most suitable way to create the recommended reuse catalog/repository. It concluded that using the **XOOPS content management system with appropriate modifications** would be the best option for creating a Reuse Enablement System that will provide the community of Earth science software developers with reusable software assets.

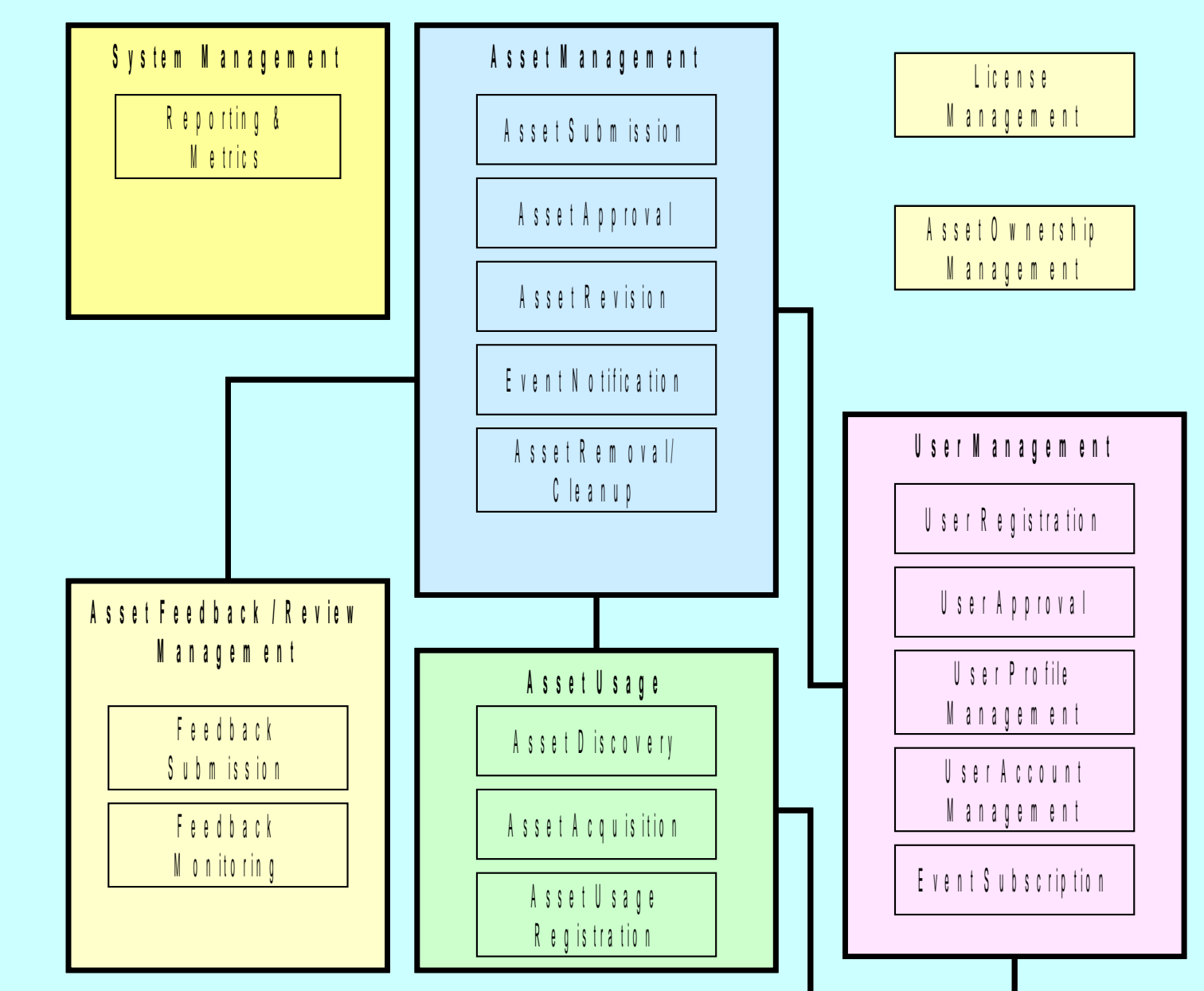
Approach Studied	# Req's Met	# Req's Not Met	# Req's Partially Met	Development Effort Estimate [staff-months]
XOOPS	40	9	5	8.12
Savane	24	20	10	34.01
GCMD	26	24	4	N/A
GForge	20	26	8	N/A

Technical evaluations



Use Cases and Requirements

Sixteen use cases for the proposed RES were developed in 2004 and formally documented in 2006. They were used to create a set of requirements for the system (below), which were formalized into 54 requirements in four categories in 2006 (titles and groupings were revised in 2007 for clarity). Consistency checks between the requirements, test plan, and policies have resulted in minor edits to the requirements, made in 2008.



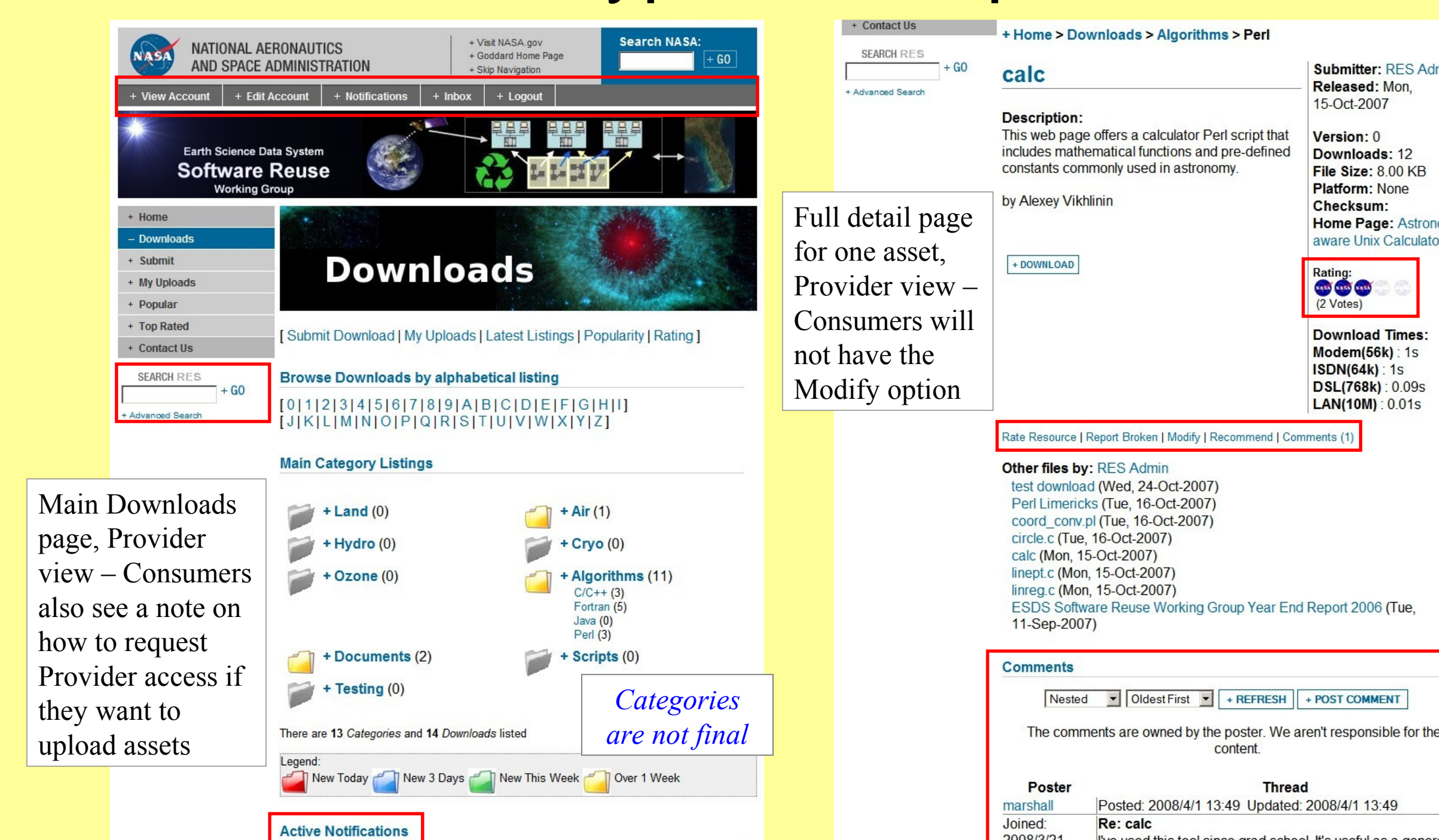
A diagram of the general RES requirements. Other functional requirements include minimal operational support, performance, security, and technology. Important non-functional requirements include domain (Earth science focus) and type of assets provided (small-sized components).

Test Plan

The WG is now completing a test plan in order to ensure that any prototype or operational RES that is built meets the formalized requirements. It includes **tests for each of the 54 requirements**, with all steps of the test described in detail. Once the document is reviewed and approved by the WG, a formal test of the prototype RES will be performed. A consistency check between the test plan and requirements have led to some minor modifications of the requirements.

Prototype Development

As the architecture study neared completion in late 2007, the WG used its findings to begin developing a prototype of the proposed RES. Over a period of about 8 months in 2007–2008, members of the WG installed, configured, and modified the XOOPS content management system to serve as a prototype RES for the Earth science community. It has been tested informally by the WG, and these reviews have provided valuable feedback used to improve the system and its features; e.g., WG recommendations led to improvements in the way multiple versions of the same asset are linked and listed.



Shown here are two screen shots of the prototype: the main download page (left) and the full detail page for one asset (right). Highlighted with red boxes are **some of the prototype's main features**. Future plans for the RES, pending appropriate approvals, include performing an initial population of the system, deploying it for NASA-only use for testing/validating in an operational environment, and eventually deploying it to the wider community.

RES Policies (Draft)

Policies for the operation and maintenance of the proposed RES are also being developed by the WG. Through a series of discussions, drafts, reviews, and edits, 30 policies were created covering the areas of user policies, downloads, communications with the community, intellectual property and copyright, privacy and security of information, and support for users. The WG has developed an initial version of the document that will be reviewed by other relevant parties to ensure appropriateness and completeness. The policies are also being checked for consistency with the requirements, suggesting some possible modifications to the policies.

For more information about the WG, please visit:
<http://www.esdswg.com/softwarereuse>

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